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## DEFINITION OF CONDITIONALLY PERMANENT PART OF CURRENT LIABILITIES OF A BANK<sup>1</sup>

*The article deals with the questions of the definition of the conditionally permanent part of current liabilities of a bank. The purpose of this article is to develop a scientific and methodological approach to determine the conditionally permanent part of the current liabilities of a bank under the conditions of the complexity of data acquisition and processing of the data on factors that influence on demand deposits. The main hypothesis is the assumption of the heterogeneity of the variance of the daily cumulative sum of demand deposits. The analysis of scientific and methodological approaches that allow determining a stable part of current liabilities proves the need for further improvement of scientific instruments. In particular, a coefficient analysis that is proposed by some of the scholars, mainly, considers the average values of turnover on accounts, which in turn, can vary considerably throughout the calendar year. The use of the probability distributions to determine the expected value of the constant sum of deposits is possible only in the case of "ideal" financial conditions, when the impact of factors on the aggregate sum of deposits is not taken into account. The developed statistical models leave out the possible heterogeneity of the dispersion of this balance. In the article, it is proposed to apply econometric methods, namely, the methods of time series analysis to test the hypothesis of the variance heterogeneity of the cumulative sum of demand deposits, using daily data. In particular, the formalization and evaluation of EGARCH-model parameters are conducted. The EGARCH-model allows to take into account the non-linear, asymmetric effects of fluctuations in the financial series. The determination of the conditionally permanent part of demand deposits is proposed on the basis of the revealed regularities. The results of the research prove the hypothesis of the non-stationary character of the variance in daily balance of demand deposits. It may result from the economic shocks influence. The proposed scientific and methodological approach may be applied in the bank liabilities management both at the micro level and at the regional level of banking network.*

**Keywords:** transformation of current liabilities, demand deposits, conditionally permanent part of settling funds, forecasting, asymmetric effects, variation in the demand deposits volatility, statistical models

### Introduction

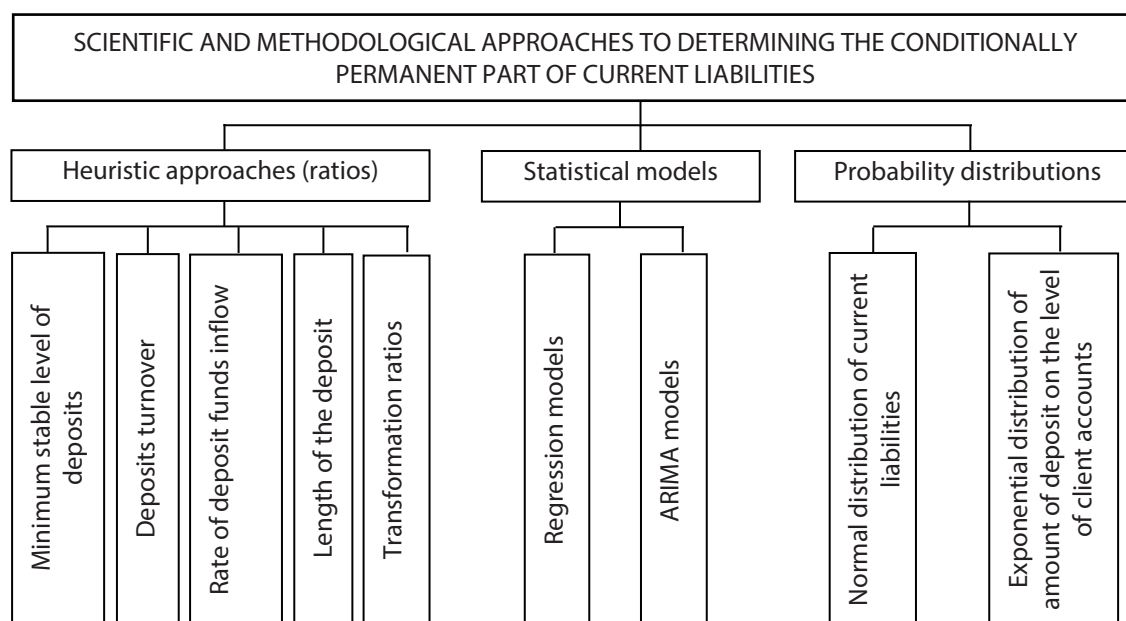
One of the most important functions of the banking sector is the formation of credit and investment resources. Processes of banking resources transformation ensure qualitative changes in parameters of funds accumulated by the Bank and bringing them into line with the requirements of the Bank's credit, investment activities and maintenance of the desired liquidity [1, p. 16]. In this case, transformation means a set of techniques and ways of combining short-term deposits and loans when the major part of their total forms a continuous, stable or "irreducible" balance [2, p. 24].

The transformation of banking resources occurs both at the micro- and macrolevels: banks accumulate "short" and "small" deposits, transforming them into "long" and "large" resources and pass them to the agents in the economy to finance investment operations. As a result, of investment and credit multiplication and transmission of money flows through the market economic system, long-term resources return into the banking system in a transformed form, largely in the form of "short" and small demand deposits.

The stability of transformations of the funds accumulated by the banking sector into credit and investment resources, while banks mediate, depends on the ratio and nature of the influence of internal and external factors. Thus, skillful, scientific and reasonable management of bank resources must ensure on the one hand ability of banks to fulfill their obligations to their depositors and creditors, and on the other hand to bring the margin sufficient to develop the banking business.

Among the banking resources, demand deposits have traditionally been considered the least stable form of resources [3, p. 22]. Daily balance in such accounts is a random variable that ranges from zero to a certain maximum depending on how sustainable is the client's business activities, and also demand

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**Fig. 1.** Classification of scientific and methodological approaches to determining the conditionally permanent part of current liabilities

for the products or services, activity of conducting transactions on the account, financial stability of a client as well as the number of clients, the level of business activity in the state and in the region, including seasonality.

However, taken together, deposits are quite a large and relatively cheap additional banking resource, which is expedient to transform into "long" and "large" resources. In addition, asset management system providing full coverage of these liabilities by highly liquid assets is considered inefficient in banking practice [4, p. 17]. Typically, coverage with readily obtainable assets ensures only the unstable part of demand deposits. Therefore, to determine the conditionally permanent part of demand deposits which would provide the desired ratio of liquidity and profitability is an important task for bank management.

Definition of the irreducible part of demand deposits and their use as a resource for placement in fixed assets was studied by A.P. Vozhzhov [1, 2], E.B. Gerasimova [3], A.T. Karcheva [5], P.V. Konyukhovskiy [6], O.I. Lavrushina [7], Y.S. Maslennchenkova [8], G.S. Panova [9], K.R. Tagirbekov [10], V.S. Suhkarskiy [11], Yu. Tolochko [4] and other scientists [12–14].

Scientific research and wide debate in banking management regarding the determination of conditionally constant part of current liabilities gives an indication of its relevance and practical significance for the banking sector, and the need for effective financial and monetary management, in turn, requires the development of the banking theory, identification of fundamental laws that determine the formation of long-term bank resources.

Classification of scientific and methodological approaches to determining the level of stabilization of current liabilities is shown in Fig. 1.

### Heuristic approaches

Scientists K.R. Tagirbekov, G.S. Panova, O.I. Lavrushin, I.R. Schiller suggested calculating minimum stable level of demand deposits as follows:

$$L_{\min} = \frac{B_{av.}}{D_{inf.}} \cdot 100\%, \quad (1)$$

where  $L_{\min}$  is the minimum stable level (the rest) of demand deposits;  $B_{av.}$  — the average balance of demand deposits during the period;  $D_{res.}$  — inflows of money on deposits during the period (credit turnover).

It should be noted that formula (1) does not take into account the peculiarities of formation of the irreducible balance. In particular, in some banks, with a relatively constant value of conditionally constant part of current liabilities, there are different ranges of deviations of the balance. In other banks, on the contrary, with varying conditionally constant part, the same ranges of deviations are

observed. The use of average balance in the formula is justified. However, the use of the credit turnover values due to the features mentioned above, is not logical and does not allow to determine the amount of the irreducible balance.

E.B. Gerasimova mentions that: "The closest value for determining the minimum stable level (the rest) of demand deposits is the value of their minimum balance. The minimum balance for the period is determined separately for each of the identified clients groups by an array of daily balances, for seasonal clients for the last quarter, for the rest—for six months. The sum of these minimum values will be a conditional minimum balance on the demand accounts of a bank for the analyzed period" [3, p. 23]. The author reveals the nature of formation of the minimum balance, but does not quantify its definition.

V.S. Sukharski proposes to calculate the deposits turnover rate by the following formula:

$$\text{Turnover rate} = \frac{\text{The inflow of deposits}}{\text{The average balance (rest) of deposits}} \times 100\%. \quad (2)$$

Formula (2) is the inverse of formula (1) with the same constituent elements, and it also does not reflect the formation of the irreducible balance.

G.S. Panova, O.I. Lavrushin, K.R. Tagirbekov, U.S. Maslennenkov, V.S. Sukharski proposed to calculate the rate of deposit funds inflow:

$$R_{inf.} = \frac{B_e - B_s}{D_{inf.}} 100\%, \quad (3)$$

where  $R_{inf.}$  is the rate of funds inflow in deposits;  $B_e$  is the balance of deposits at period's end;  $B_s$  is the balance of deposits at the start of a period;  $D_{inf.}$  is deposit inflows.

Formula (3) reflects the ratio between the increase in the deposit balances and the credit turnover, but does not determine the value of the irreducible balance.

K.R. Tagirbekov, G.S. Panova, O.I. Lavrushin, U.S. Maslennenkov suggested another indicator that can be used to stabilize the current liabilities, namely, the average length of the deposit terms:

$$T_{av.} = \frac{B_{av.} \times D}{D_w}, \quad (4)$$

where  $T_{av.}$  is the average period of demand deposit;  $B_{av.}$  is the average balance during the period;  $D$  is the number of days in the period under consideration;  $D_w$  is withdrawal or transfer of funds during the period (debit turnover).

Formula (4) provides the definition of period of storage of funds in demand accounts. However, it does not show whether the funds will only be stored or their placement is provided as well. The period for which they can be placed in assets is not defined.

V.S. Sukharski suggested a slightly different formula to determine the length of the deposit:

$$L_{av.} = \frac{360}{T_{dep.}}, \quad (5)$$

where  $L_{av.}$  is the average length of the placing of one monetary unit (days) on the deposit accounts;  $T_{dep.}$ —deposit turnover.

P.V. Konyukhovskii, G.S. Panov, O.I. Lavrushin propose to calculate the transformation ratio as follows:

$$K = \frac{R - S}{S} 100\%, \quad (6)$$

where  $K$  is transformation ratio of short-term resources into long-term ones (used by French banks);  $R$  is short-term resources;  $S$  is short-term loans and capital investment.

Formula (6) reflects the share of short-term assets funded by short-term resources, but it does not specify the value of the conditionally constant part of current liabilities and their transformation.

P.V. Konyukhovskii, U.S. Maslennenkov suggest calculating the transformation ratio by applying the debit and credit turnovers:

$$K_T = 1 - \frac{T_{deb.}}{T_{cred.}}, \quad (7)$$

where  $K_T$  is transformation ratio of short-term resources into long-term;  $T_{deb.}$  is a debit turnover of the issued short-term loans and other short-term investments (up to one year);  $T_{cred.}$  is credit turnover of the receipt of funds on deposit accounts (up to 1 year).

Values of debit and credit turnovers in formula (7) give a general idea about the process, show variations in the irreducible balance, but do not specify its value and period of time for which resources can be placed in the assets.

To determine the amount of potential long-term investments, U.S. Maslennikov proposed the following calculation:

$$R_{pot.} = \left( \frac{F_{cl.b.}}{T_{cred.}} - F_{cl.e.} \right) T_{cred.} + F_{inv.b.} + T_{cred.t.} - F_{inv.e.}, \quad (8)$$

where  $R$  is the bank's potential resources for long-term investments;  $F_{cl.b.}$ ,  $F_{cl.e.}$  are the funds on the clients' demand accounts at the beginning and end of the compared periods of activity;  $T_{cred.}$  is a credit turnover for the placing of funds on the clients' demand accounts;  $F_{inv.b.}$ ,  $F_{inv.e.}$  are funds on bank's accounts meant for lending and investments for a period of over 1 year respectively at the beginning and end of the compared periods of activity;  $T_{cred.t.}$  is a credit turnover for receipt on the client's account the term funds.

To determine the bank's potential investments in long-term resources formula (8) we imply the demand funds and urgent funds, which does not reflect the technology of transformation of demand deposits into current liabilities. Such technology is based on the use of some part of the bank's current liabilities as long-term investments.

According to the conducted analysis, we can make a conclusion that assessing the level of transformation of current liabilities is of significant importance for banking practice. However, the ratios above are quite different, and sometimes even contradict each other.

### Probability distributions

A number of papers [1–2] describe a system study on identification of regularities in formation of fund balances for individual current accounts and bank's current liabilities. According to the results of the research the following features were found:

1) If the impact of external factors is excluded, then the density of probabilities of fund balances distribution functions of the distribution  $x_i$  at the end of each day may correspond to different distribution laws: normal, exponential or uniform law with its mathematical expectation  $m_i$  and standard deviation  $\sigma_i$  (Fig. 2).

2) External factors that influence the dynamics of current liabilities include the number of clients, number of accounts, seasonality, demand for clients' products, etc.

3) Current liabilities are formed as a sum of demand deposits, with unstable remains varying from zero to their maximum "overlap" each other, thus creating the "irreducible" balance in the form of conditionally permanent part of current liabilities [2, p. 206].

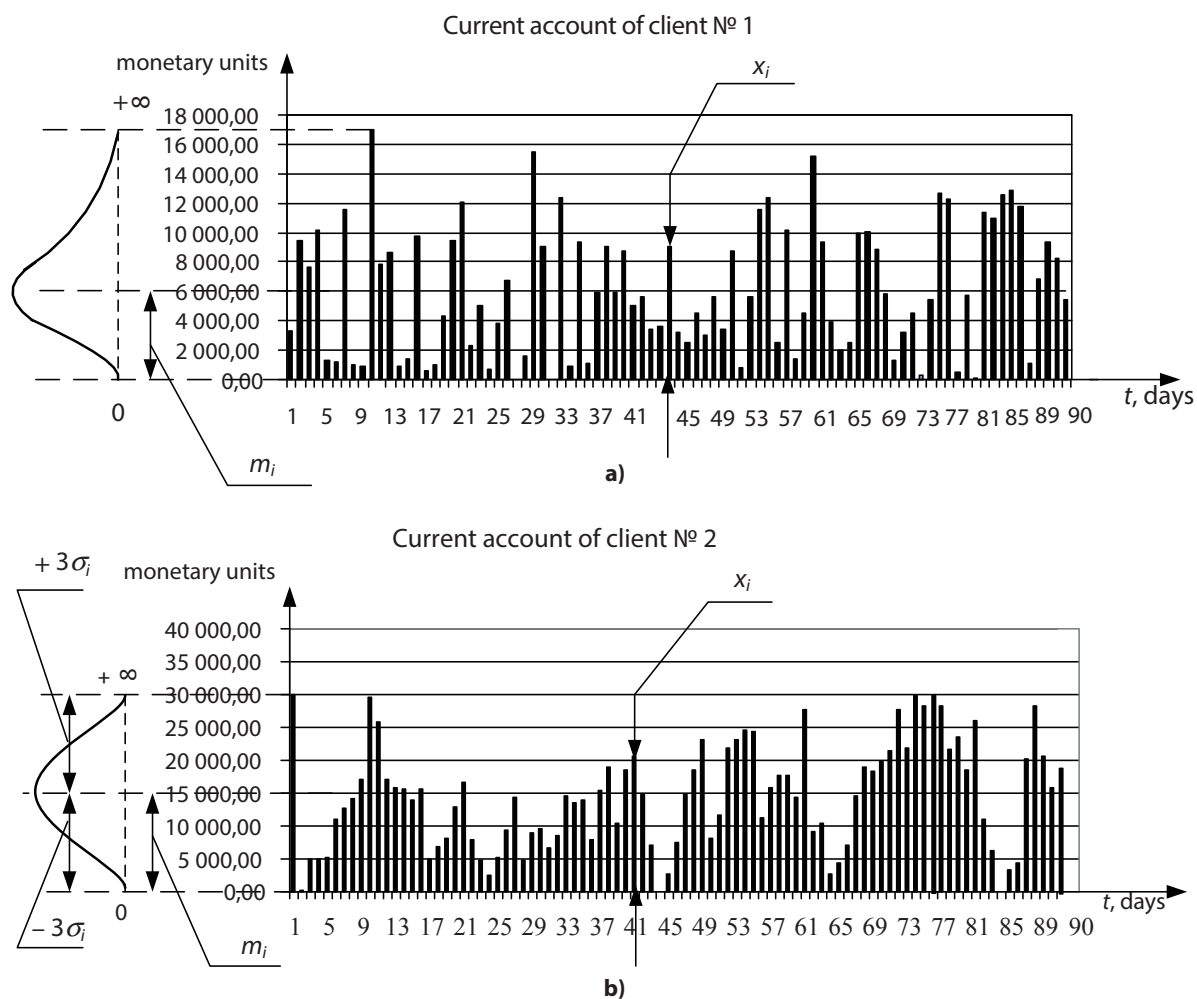
4) Ideally, current liabilities during the period under consideration are not subject to changes due to seasonal variations, changes in peak turnovers on the accounts, and change in the number of clients on settlement and cash services. In this case, on the basis of the Central limit theorem, we can say that distribution of current liabilities (CL) as a sum of all individual current accounts is approaching normal distribution law (Fig. 3).

The graph in figure 3 shows the formation of current liabilities in simplified form. Their average value  $M_\Sigma$  and the range of deviation  $\pm 3\sigma_\Sigma$  remain constant in the considered time interval. Current liabilities include two parts: conditionally permanent part ( $CL_{const.}$ ), which does not change in this ideal case, and variable ( $CL_{var.}$ ), the so-called "flickering" part of current liabilities.

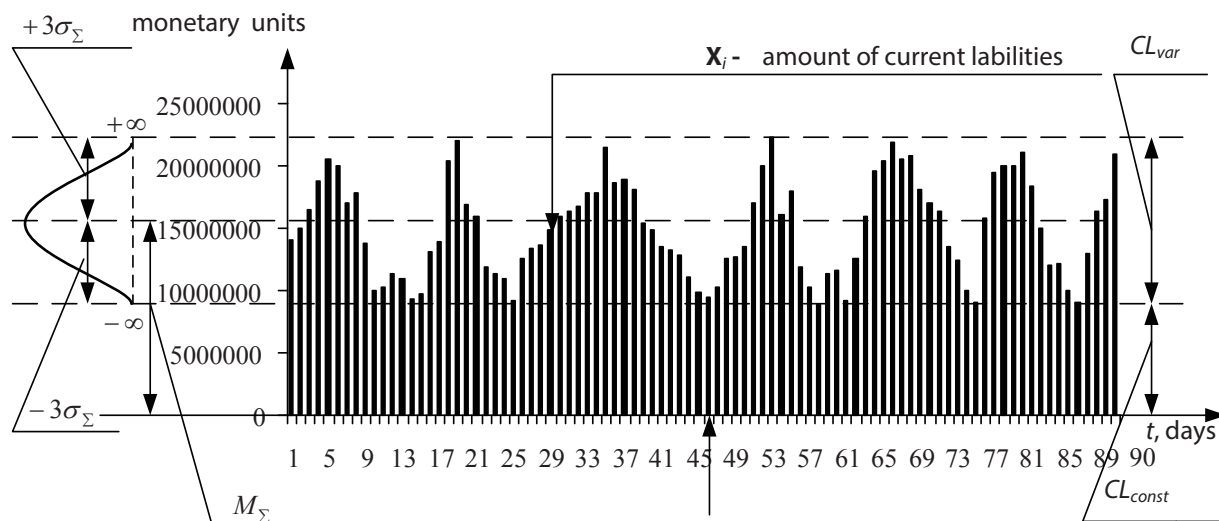
In order to identify the fundamental patterns and quantify the formation of conditionally permanent part of current liabilities, [2] it is proposed to consider the distribution of current liabilities in the classical form as a normal distribution law. Accordingly, the value of conditionally permanent part of current liabilities ( $CL_{const.}$ ) is defined as the difference between the total mathematical expectation ( $M_\Sigma$ ) and the possible deviation of the variable part of current liabilities to decrease by  $3\sigma_\Sigma$ :

$$CL_{const} = M_\Sigma - 3\sigma_\Sigma,$$

$$\text{or } CL_{const} = \sum m_i - 3\sqrt{\sigma_i^2}. \quad (9)$$



**Fig. 2.** Bank's current liabilities on clients' individual accounts



**Fig. 3.** Bank's current liabilities

If we assume that parameters  $m_i$  and  $\sigma_i$  are the same for all current accounts, then formula (9) looks as follows:

$$CL_{const} = m \times n - 3\sigma\sqrt{n}, \quad (10)$$

where  $m$  is the average balance for each of the current accounts;  $\sigma$  is a standard deviation for each of the  $n$  current accounts,  $n$  is a number of current accounts serviced by the bank.

It follows from formula (9) that  $CL_{const}$  is in the direct relationship to the number of current accounts and the average values of their balances.



Thus, it is possible to define the conditionally permanent part of demand deposits on the basis of probabilistic models of distribution laws, but only if the impact of the most significant factors discussed above is excluded. Note that in some cases sampling of actual data on current liabilities, and demand deposits, in particular, may follow the normal law of distribution. However, such sampling representing a time series may not be stationary. Therefore, in this case, the definition of the conditionally permanent part on the basis of the "adjusted" law of distribution will be incorrect and may lead to increase in potential liquidity risks in the process of transformation of banking assets into credit-investment resources.

### Statistical models

Regression models in which demand deposits are modelled as a function of the number of clients, number of client accounts, seasonality and other factors. According to the research made on actual data from banking institutions, distribution of daily balances of demand deposits only had approximate relation to a particular law of distribution due to the effect of unaccounted factors that have a significant impact on the formation of current liabilities.

To solve this problem, A. T. Karcheva proposed an approach to defining the irreducible balance of current liabilities, which is based on the use of analytical trend and allows to determine investment opportunities of banks more accurately [5].

Subsequent research in this direction [15] allowed to specify and estimate multifactor regression models of dependence of demand deposits from a number of determinants (seasonality, number of clients), in particular:

$$Y_t = \beta_0 + \beta_1 \times M_t + \beta_2 \times N_t^{nc} + \sum_{j=3}^{13} \beta_j X_j + \varepsilon_i, \quad (11)$$

where  $Y_t$  is the level of demand deposits at time point  $t$ ;  $M_t$  represents ordinal values of calendar months (trend);  $N_t^{nc}$  — average monthly number of clients;  $X_j$  — concomitant variable in a time series;  $\beta_0, \beta_1, \beta_2$  are regression parameters;  $\beta_j$  — seasonality index;  $j$  — ordinal numbers of months in a year;  $\varepsilon_i$  — model error (with mathematical expectation  $M(\varepsilon_i) = 0$  and variance  $\sigma^2(\varepsilon_i) = \sigma^2$ ).

We assume that the distribution of the error of model ( $\varepsilon_i$ ) is normal and use the previously introduced notation  $CL_{const}$  to write the expression, which is based on formula (10) and determines the value of the conditionally permanent part of demand deposits for period  $t$ :

$$CL_{const(t)} = \hat{Y}_t - 1,96\hat{\sigma}_{\varepsilon_i}, \quad (12)$$

where  $\hat{Y}_t, \hat{\sigma}_{\varepsilon_i}$  are estimated values of deposit levels and standard deviation, respectively.

Authors believe that using  $1.96\sigma$  instead of  $3\sigma$  (formula (9)) as a range of possible deviations in formula (11) is justified by the properties of the probability density of the normal distribution law. It is known that the level of reliability (probability) of a random variable  $X(\varepsilon_i)$  falling in the interval  $(M(x) \pm 1.96\sigma)$  is 95% [16].

This scientific and methodical approach to accounting for the complex of factors determining the conditionally permanent part of demand deposits, in fact, qualitatively complements the purely stochastic models.

With this said, note that data aggregation on total balances, the number of clients and their accounts at the level of calendar months (formula (10)), revealed the significant statistical relationship between the level of demand deposits and analyzed factors. It can be used for forecasting and planning banking.

There is also another aspect of the problem which was not considered previously. The nature of financial time series, which includes demand deposits, does not exclude the presence of non-linear relations between the analyzed parameters and error variance ( $\varepsilon_i$ ) can be non-constant. Besides this, there is an objective necessity in testing the hypothesis about the presence of clusters/pools in the changes in balances of demand deposits, when significant deviations are preceded by high ones and insignificant deviations — by slight variations.

Quite uneven nature of changes in daily balances of client accounts, possible so-called "interventions" (abrupt change of funds on the account) [4, p. 18], enhance the question of identifying and assessing temporal patterns of daily (current) balances of demand deposits.

II. Autoregressive integrated moving-average models (ARIMA) can be used when it is difficult to obtain and process the data on determinant factors of demand deposits. Besides this, scientific-methodical approaches for determining the conditionally permanent part of demand deposits, based on the use of ARIMA reveal temporal regularities of changes in demand deposits from their daily balance.

As an example of the use of ARIMA models, we can mention research of the National Bank of the Republic of Belarus [4]. The bank specialists proposed the following scheme of study to predict the estimated stable balance on the demand account:

1) Selection of the most appropriate ARIMA model, which obtains confidence intervals (with 85 % probability) of future values of the balances on the demand account. As a result, the most adequate forecasting model was found (ARIMA(1, 1, 0)) to describe the actual fund balances in the client's accounts [4, p.19].

2) Analysis and assessment of the probability of interventions (extraordinary write-off) which are also called extraordinary deviations in financial studies. Under the assumption that significant withdrawals of funds from the account (in a stable economic environment) are not frequent, a histogram of their log-normal distribution was built and estimated. Given that substantial (extraordinary) write-off occurs seldom, the bank estimates the maximum range of extraordinary deviations that will be only exceeded with a given probability. Thus, by setting the priori level of probability, the banking institution determines the level of risk that it is ready to take in the process of bank liquidity management.

3) Forecasting of the balance of the demand account. Specialists of the National Bank of the Republic of Belarus proposed to consider the following variants of events:

- if the dynamics of the balance of the demand account does not have frequent significant write-offs, then ARIMA model can be used to determine the stable balance and in this case to use confidence predictive interval built on the basis of assessment of this model;

- if there are frequent sudden significant fluctuations of balances on the current account, then their conditionally permanent part will correspond to their current value minus the probable amount of intervention (extraordinary deviation) of the confidence interval set by the bank [4, c. 20];

- if the Bank relies on a case of simultaneous occurrence of the two events mentioned above, then it is proposed to use the value equal to the difference between the minimum balance in the account predicted by ARIMA models and assessment of possible intervention for the set corresponding confidence intervals of these two events as the conditionally permanent balance of demand account

The analysis of the scientific and methodological approach to forecasting conditional permanent balance on clients' current accounts proposed by scientists S. Tolochko and N. Mironchuk, allows to conclude the following:

1) The described approach, according to the authors, can be used for asset management in both commercial and central banks (for example, in liquidity management of foreign exchange reserves).

2) Researchers did not consider the nature of fluctuations in total fund balances of demand deposits. They focused on quite volatile balances on an individual current account. In our opinion, when managing resources in the practice of bank management, current liabilities are mostly considered as a collection of current fund balances on the clients' accounts, and the clients are not distinguished depending on the amount and dynamics of account balances (except for VIP-clients). The economic effect of taking into account the aggregate balances of demand deposits is manifested in higher potential amounts of conditionally permanent part of current liabilities, which the bank can transform into credit and investment resources.

3) Scientists do not specify the criteria for selecting substantial sudden write-offs, and their limit frequency for the bank to select a corresponding method of calculation of the conditionally permanent part of demand deposits.

4) The approach under consideration generally can be used as a basis for determining the conditionally permanent part of the total deposits of the bank, on condition of verification of the hypothesis on variance homogeneity, absence of clustering of its volatility (sudden changes in the form of outflow or inflow of funds are not damped out, and continue for some time) which, in turn, may require revision of the scientific-methodological tools: the use of ARCH/GARCH models in addition to ARIMA.

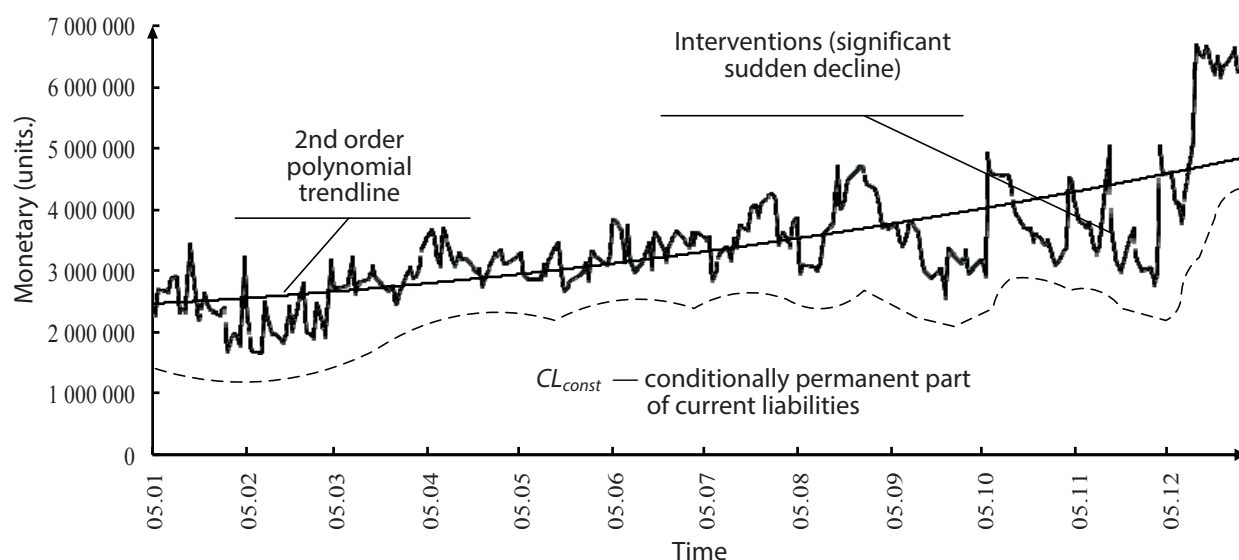


Fig. 4. Total demand deposits

### Results

Taking into account the features of the considered scientific and methodical approaches determining the total value of the conditionally permanent part of demand deposits we propose to continue developing the scientific tools for solving this problem. Consider the daily total balances of demand deposits of legal entities on the example of one of the Sevastopol banking institutions for a period of one calendar year with details on working days (five-day working week), as shown in figure 4.

The analysis of figure 4 reveals a number of peculiarities in the dynamics of the analyzed financial time series, in particular:

1) Throughout the time interval, the total balances did not fall below 1600 thousand monetary units and had a non-linear growth trend, which indicates the presence of a conditional-constant value in their dynamics in a stable economic environment.

2) Balances are very volatile and, apparently, have a seasonal component.

3) The presence of clear trends and seasonality in the dynamics of the analyzed balances restricts the use of heuristic and purely stochastic models (Fig. 1) to determine the conditionally permanent part of demand deposits with reasonable certainty.

4) The visually identified volatility of fund balances requires to validate the hypothesis about the heterogeneity of their variance. In the case when this hypothesis is confirmed, it is necessary to choose the most adequate statistical model for determining the amount of deposits that a banking institution will be able to pass to credit-investment projects without significant liquidity risks.

Analysis of dynamics of demand deposits with the use of the known statistical methods [4, p. 18], in 12 cases of total fund balances, which had an extraordinary "surge" and rapid "fading" for one or two operating days, were determined and excluded from the financial series.

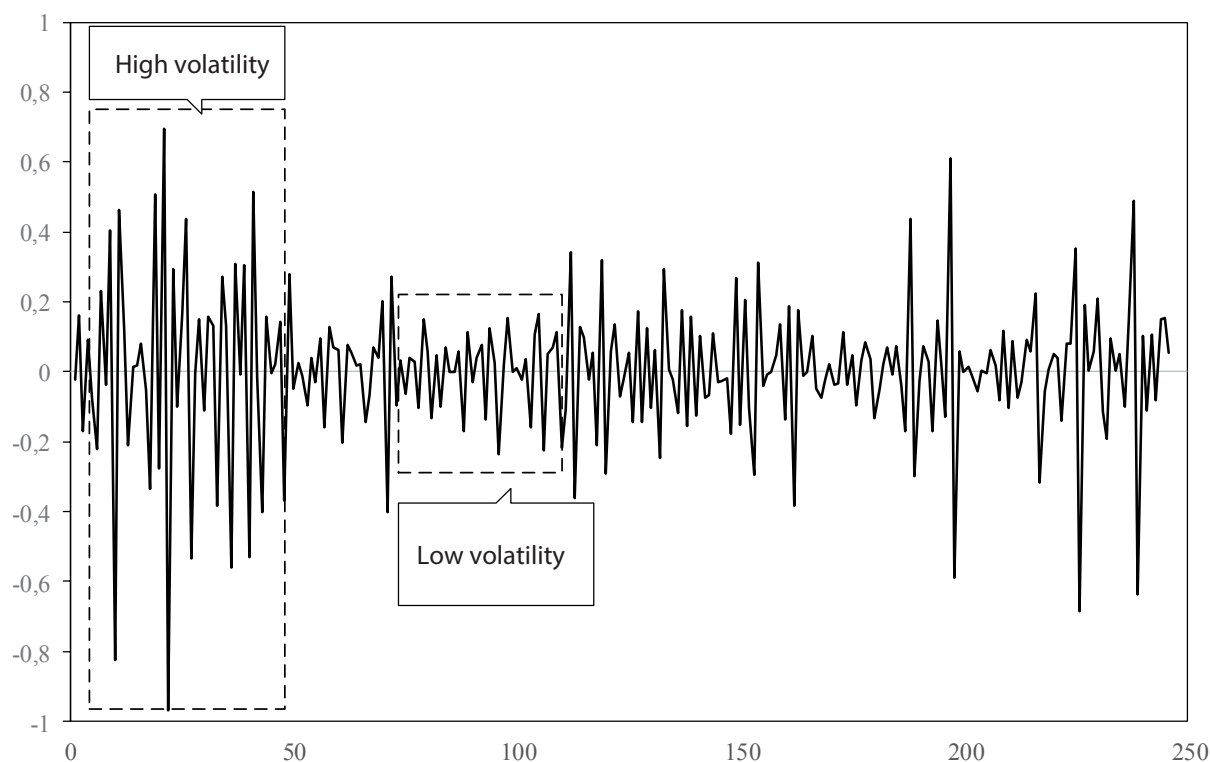
Method. We used ARCH-method to verify the hypothesis about the volatility of variance of demand deposits (Fig. 4). All necessary calculations were made in "EViews" econometric package.

Taking into account the nonlinear nature of the dynamics of demand deposits (Fig. 4), we transformed the prepared time series ("d") into a series of second differentials of logarithms of its values —  $\Delta^2 \log(d)$ , as shown in figure 5.

Then we built the regression with  $\Delta^2 \log(d)$  parameters and a constant, and tested the residues of this regression for ARCH-effect. The calculation results confirmed the hypothesis about heterogeneity in the variance of demand deposits. Returning to the above-described scientific and methodical approach of S. Tolochko, N. Mironchuk, we would like to stress the objective necessity of a preliminary check of this hypothesis. If it is confirmed, forecasting of the conditionally permanent part of the demand deposits should be made taking into account the revealed volatility of their variance.

We omit the detailed description of searching for the most suitable model of forecasting demand deposits, which takes into account the ARCH effect, we only give the final result of the research. According to the data analyzed, the best-integrated model of autoregression of integrated moving average was ARIMA model (1, 2, 1):





**Fig. 5.** Series of second differentials of logarithms of values of demand deposits

$$\Delta^2 \log(\hat{d})_t = -0,112 \Delta^2 \log(d)_{t-1} - 1,042 \varepsilon_{t-1}, \quad (12)$$

where  $\Delta^2 \log(\hat{d})_t$  and  $\Delta^2 \log(d)_{t-1}$  are estimated and actual values of logarithmized values of demand deposits in periods  $t$  and  $t-1$  (with a level of integration equal to 2) respectively;  $\varepsilon_{t-1}$  — the error value of the model in period  $t-1$ .

Further data analysis showed that different amplitude of the total balances on the accounts in different periods of time (clustering of volatility) may be caused by the influence of positive and negative market shocks on the economic activity of clients of the bank. These shocks may be associated with the comprehensiveness of information available to economic agents (bank clients) relative to market conditions, the financial condition of the counterparties and clients. Ultimately, the presence of information asymmetry between the subjects of economic relations leads to different reactions of each subject to new information ("bad", "good" news).

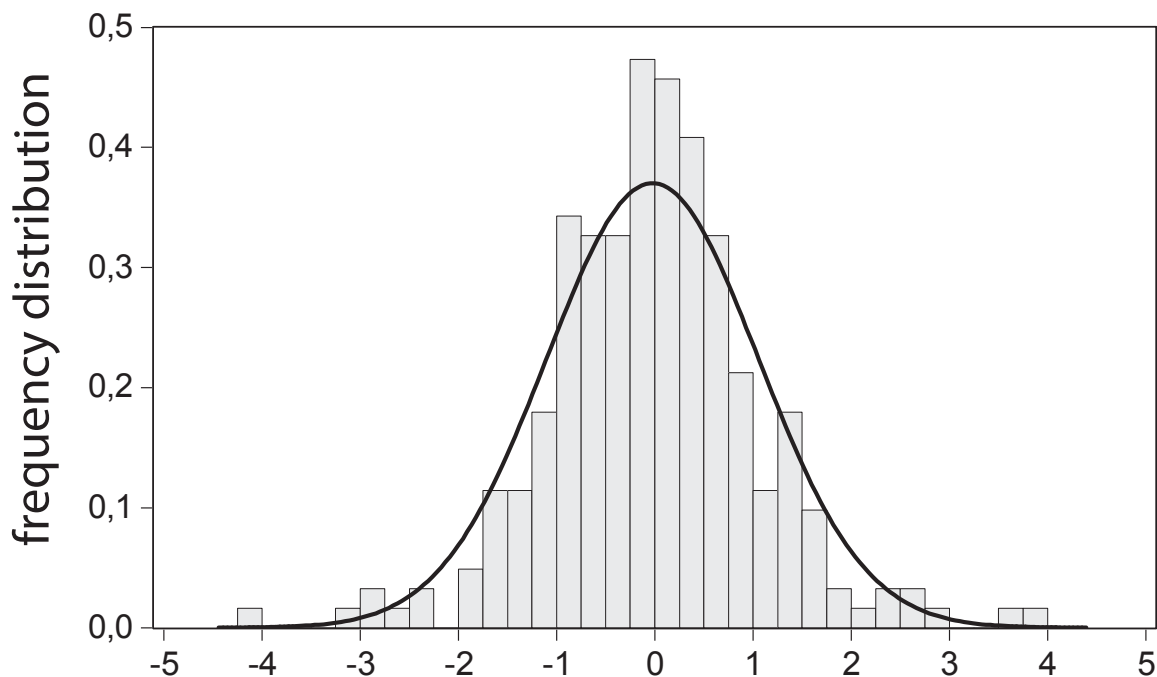
The analysis of figure 5 confirms the presence of asymmetric effect: during January-February, the bank faced the increase of variation of the total balances on the accounts, which could be the result of clients' negative expectations of the future macroeconomic situation in the country. The best model that could explain the nonlinear change in the error variance in equation (12) was the EGARCH model (with exponential effect of asymmetry [17]):

$$\log(\hat{\sigma}_t^2) = 0,062 - 0,085 \frac{|\varepsilon_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - 0,206 \frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}} + 1,01 \log(\sigma_{t-1}^2), \quad (13)$$

where  $\hat{\sigma}_t^2$  is the estimated  $\varepsilon_t$  error variance.

All the estimated parameters of equations (12), (13) proved to be statistically significant, and the determination coefficient amounted to 0,614. The assumption that the distribution of the error ( $\varepsilon_t$ ) is normal was rejected, although the density of the distribution of standardized values has a shape quite close to the normal law (Fig. 6).

In this regard, it should be noted that the conclusions based on the assumption of normal error distribution may be well-founded [18, p. 35]. It is known that the normal law of distribution is limited, and other laws of distribution approach it under very common typical conditions. Therefore, the analysis of daily amounts of demand deposits in large samples and identification of seasonal components of the



**Fig. 6.** The histogram of the theoretical (normal) and the empirical distribution of the  $\varepsilon_t$  error

financial series, which can be seen in the calendar years (in our example only one year), may well lead to the confirmation of the correctness of this thesis.

Using formulas (12) and (13) we offer to determine the conditionally permanent part of demand deposits  $CL_{const}(t)$  on the basis of the following expression:

$$CL_{const(t)} = \hat{d}_t - k\hat{\sigma}_t, \quad (14)$$

where  $\hat{d}_t$  is estimated the value of demand deposits in period  $t$ ;  $k$  is the value of the normalized standard deviation corresponding to a specified level of reliability;  $\hat{\sigma}_t$  is the estimated standard deviation of the error  $\varepsilon_t$ .

Taking into account the asymptotic approximation of the error  $\varepsilon_t$  distribution to the normal law, we set the parameter  $k$  at the value level of 1,96, which corresponds to 95 % level of reliability of the forecast with respect to modeled variance  $\hat{\sigma}_t^2$ . Hence, formula (14) can be written in the form:

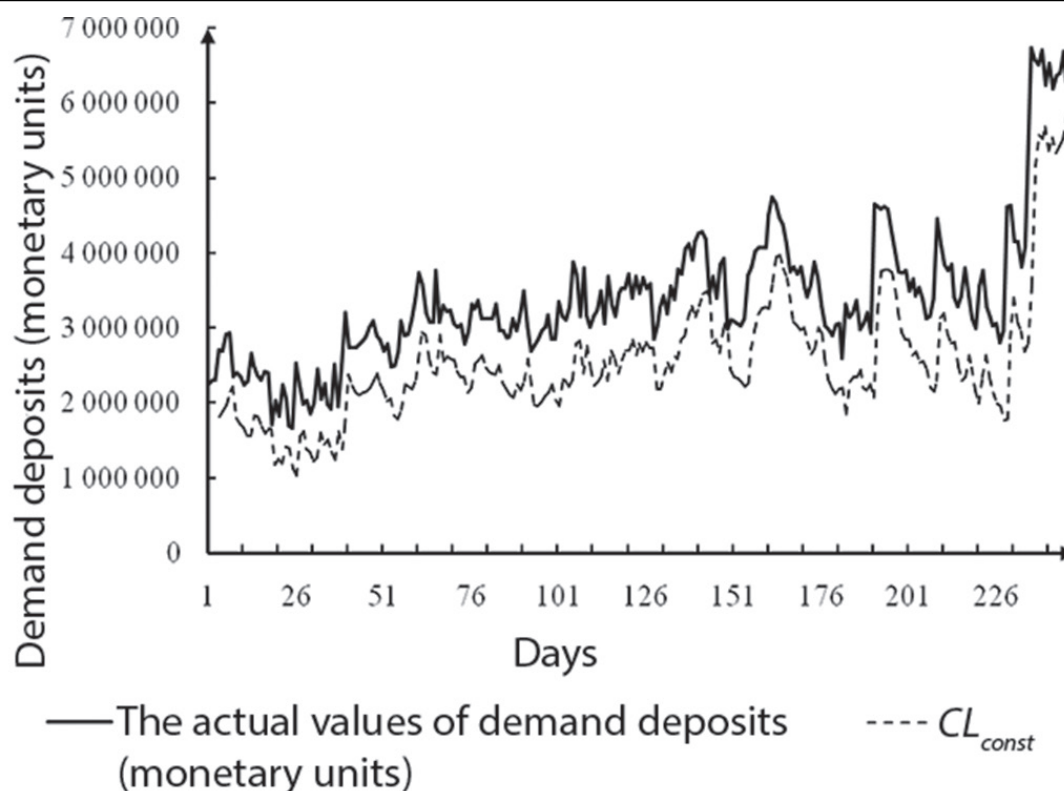
$$CL_{const(t)} = \hat{d}_t - 1,96\hat{\sigma}_t.$$

Illustration of the conditionally permanent part of demand deposits on the basis of the proposed scientific and methodical approach is shown in figure 7.

### Conclusions

Thus, the proposed scientific and methodical approach to determine the conditionally permanent part of demand deposits, which implies the construction of their short-term interval forecast is based on the step-wise statistical processing of financial series to identify patterns in their dynamics. The results of the study confirmed the hypothesis of asymmetric effects in the distribution of the variance of demand deposits. These effects are caused by positive and negative shocks, which the bank's clients constantly face in their business activity.

The economic effect of the application of the proposed scientific and methodical approach compared to the analyzed methods (heuristic and statistical) means the more rational use of "cheap" and at the same time non-stable demand deposits for financing the bank's long-term active operations. In our view, determining the level of conditionally permanent part of current liabilities, taking into account the potential volatility of the variance of total demand deposits, can have a positive impact on the quality of banking planning for using the potential of short-term resources of the bank, which, in turn, can be the subject of separate research.



**Fig. 7.** Definition of the conditionally permanent part of demand deposits

In addition, the identified and modeled patterns in the change of total demand deposits create real conditions for effective management of bank liquidity, pricing of bank resources, which creates positive preconditions for more active involvement of the banking sector in investment processes at the meso- and macro- levels of the national economy.

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